How good is the internal evidence for multiple-level phonological computation? A view from Russian

How good is the internal evidence for multiple-level phonological computation?

A view from Russian

Pavel Iosad
Universitetet i Tromsø/CASTL
pavel.iosad@uit.no

What's in a Word?
17. september 2010
Universitetet i Tromsø/CASTL

Talk outline

1. Context
2. Case studies from Russian
   - Backness switch
   - Palatalization
   - Obstruentization of /v/
3. The value of internal evidence…
4. …and why it isn't enough
5. Conclusion

Historical context

- Generative phonology is said to basically start with Russian: Halle (1959)
- Plenty of classic generative accounts such as Lightner (1972)
- Also taken up within Lexical Phonology, figures in Kiparsky (1985)
- Most analyses very abstract, sometimes even more so than Chomsky & Halle (1968)

A typical example

- From Halle & Matushansky (2002)
- The following rules are all extrinsically ordered:

1. Palatalization: [αback] spreads C ← V
2. Velar mutation: $\text{dorsal}_{[-\text{back}]} \rightarrow$ [coronal −ant +strident]
3. Iotacism: $V_{[-\text{high}]} \rightarrow$ [i] / $C_{[-\text{back}]}$_
4. Depalatalization: š ž c → [+back]
5. Velar palatalization: k g x → [−back] / $\_V_{[+\text{high} -\text{round}]}$
6. Hi-switch: [αback] spreads C → $V_{[+\text{high} -\text{round}]}$

Example derivation (I kid you not)

šerstIstij	'furry'
⇓	by Palatalization
šʲerstʲIstij	
⇓	by Iotacism
šʲirstʲIstij	
⇓	by Depalatalization
širstʲIstij	
⇓	by Hi-switch
širstʲIstij	

But now we have OT

- …right?
- Wrong!
- Significant body of work arguing that Russian (and more broadly Slavic) phonological data conclusively show that some sort of multiple-level serialism is unavoidable
  - Palatalization: Rubach (2000, 2005, 2007), Plapp (1999), Blumenfeld (2003) (Stratal OT)
    - ☞ Rubach (2000) is excerpted in the McCarthy OT reader: this is apparently some of the best evidence around
  - Vowel reduction: Rubach (2000); Padgett (2004); Mołczanow (2007)
  - Yers: Mołczanow (2008); Gribanova (2009)

What is at stake?

- The analysis of Russian
  - ☞ I am not aware of any work specifically refuting the serialism-based analysis of Russian
- The issue of intermediate levels
  - ☞ Where do the levels come from?
  - ☞ What is the distinction between a multi-level phonology and non-trivial components of a modular theory of grammar?
- The value of phonology-internal evidence
  - ☞ Can we say that purely phonological data can have a decisive say on the previous issue?
  - ☞ If yes, how overwhelming must the evidence be?

Goals of this talk

- The analysis of Russian
  - ☞ Discuss some specific alternatives to a serialism-based analysis
- The issue of intermediate levels
  - ☞ Argue that an analysis likely to be accepted as within the confines of "standard OT" is possible if one capitalizes on the feed-forward model
- The value of phonology-internal evidence
  - ☞ Discuss how the validity of the phonological analysis hinges on interface considerations which are rarely explored or even explicitly discussed

Assumptions I

- Minimalist feature theory (Morén 2003, 2007; Blaho 2008)
  - Only privative features
  - Contrastivist Hypothesis (Dresher 2009; Hall 2007): only contrastive features are active in the phonological computation
  - Substance-free I: phonetic representation of a feature not necessarily uniform either across or within a language
  - Substance-free II: assignment of phonological features based on phonological activity within the language at hand
- Consequences:
  - Surface underspecification
  - Non-trivial phonetic component

Assumptions II

- Not every change you can write using IPA is the job of phonology
- Potential sources of variable realization of underlying phonological symbols ("phonetic grammar")
  - (Allomorphy)
  - Manipulation of phonological symbols ("phonology", "computation")
  - Language-specific differences in the realization of various symbols or bundles of symbols ("phonetics–phonology interface")
  - Phonetic factors such as speech rate, aerodynamic factors, effects of elasticity of the vocal tract etc. (phonetics)
- Consequence: even if "phonology" is monostratal, the feed-forward model of grammar still introduces a kind of serialism, but with principled restrictions

The basic facts

- Most consonants have a palatalized counterpart, e. g. [t tʲ] [x xʲ] [ɬ ɬʲ] etc.
- Exceptions: [ts ʂʷ ʐʷ] (only non-palatalized), [ʧʲ] (only palatalized)
- Palatalized consonants have a pretty free distribution
  - But [kʲ gʲ xʲ] are impossible word-finally
  - And rare before non-front vowels, though not impossible and even created by the morphophonology (Timberlake 1978; Flier 1982)
- Conversely, [k g x] are impossible (word-internally) before front vowels

The traditional assumptions

- Traditional as in going back to at least Halle (1959) and rarely challenged
- Six vowels, including [ɨ] which is at least [+high +back −round]
- Complementary distribution of [ɨ] and [i] depending on palatalization of the previous consonants
- Note this requires [ʂʷɨ] [ʐʷɨ] [tsɨ] but [ʧʲi]
- Assumption: at least [ʂʷ] and [ʐʷ] are underlyingly palatalized (we'll see why in a minute)
- ☞ Not available in a contrastivist theory: (non-)palatalization is redundant on the "unpaired" segments

The palatalizations I

- Mostly before front vowels:
  - C → Cʲ
  - But the same affixes often trigger [k g x] → [ʧʲ ʂʷ ʐʷ]

(1)	a.	(i)	['svʲet]	'light' (n.)
		(ii)	[svʲɪ'ʧʲitʲ]	'to illuminate'
	b.	(i)	['mukə]	'torment' (n.)
		(ii)	['muʧʲɪtʲ]	'to torment'

- Another type where only the velars are affected:

(2)	a.	(i)	['stoɬ]	'table'
		(ii)	[stɛ'ɬi]	'tables'
	b.	(i)	['krʲuk]	'hook'
		(ii)	[krʲʊ'kʲi]	'hooks'

The palatalizations II

- Yet another type where everything undergoes surface palatalization

(3)	a.	(i)	['stoɬ]	'table'
		(ii)	[stɛ'ɬʲe]	'table (loc. sg.)'
	b.	(i)	['krʲuk]	'hook'
		(ii)	[krʲʊ'kʲe]	'hook (loc. sg.)'

- Transitive palatalization: [t d s z] → [ʧʲ ʐʷ ʂʷ ʐʷ]
  - ☞ No relation to the frontness of the following vowel
  - ☞ Same output as [i]-palatalization

The traditional approach

- Palatalization: triggered by [i]
  - [ti ki] → [ʧi ʧi]
- The other palatalization: triggered by [ɨ] with later fronting following velars; ordering crucial
  - [tɨ kɨ] → [tɨ ki] → [tɨ kʲi]
- Across-the-board surface palatalization: word-level (Blumenfeld 2003) or some boundaries reproducing this effect (Plapp 1996); multiple levels crucial for counterfeeding of [i]-palatalization
- Transitive palatalization: often ignored or relegated to morphology despite the clear affinity to [i]-palatalization

Reanalysis

- Joint work with Bruce Morén-Duolljá
- Email for details of analysis or see `http://www.hum.uit.no/a/iosad/cv.html`
- Redux:
  - There is no [ɨ]
  - There is very little actual C ← V spreading of [αback]
  - The various outcomes of palatalization are ascribed to a floating feature
  - Lexical indexation allows Russian to realize a fair bit of the factorial typology for this floating feature

Backness switch and [ɨ] I

- There is no /ɨ/ in Russian
  - Phonetically it is a sort of diphthong: textbook knowledge in Russia, also Padgett (2001)
  - Basically the target is [i]
  - Phonologically it is not necessary
- The relationship between frontness and palatalization properties is complex
- Some non-front vowels trigger palatalization:

(4) a. [pʲɪˈsok] 'sand'
b. [pʲɪˈʃːanɨj] 'sandy'

- Vice versa: slightly complicated
- All /e/'s do trigger palatalization (historical accident)

Backness switch and [ɨ] II

- If all /ɨ/'s are /i/'s, they are an example of front vowels failing to trigger palatalization
- Exception: /ki/ still comes out as [kʲi]
- It is in fact the only C → V spreading process that does not fail
- The ban against [kɨ gɨ xɨ] is in fact a robust surface-true generalization
- Spreading of [αback] to [dorsal] but not other places can be achieved by local conjunction
- Obviates the frankly weird rule fronting /ɨ/ following non-palatalized dorsals only in order to front them afterwards
- Also solves the problem of the postalveolars
- The only part of the phonology where [ʂʷ ʐʷ] behave like non-palatalized consonants is where they cause [ɨ]
- But [i] → [ɨ] is not a phonological process: just the interface imposing velarization on non-palatalized consonants

Backness switch and [ɨ] III

- Therefore [ʂʷ ʐʷ] should in fact be palatalized in the output of phonology (corroborated by vowel reduction)
- Serialism comes for free from the feed-forward model

Representational assumptions

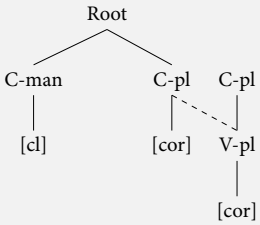
- Based on a holistic approach to Russian phonology
- V-place[coronal]
  - Palatalization in consonants with a C-place (à la Clements)
  - The only place feature for the postalveolars
  - On its own: /i/
- Floating V-place[coronal] (unattached to a Root node) must attach to something to surface
- Factorial typology for floating feature

The constraints

- Max(V-pl[cor]), or MaxFlt (Wolf 2007): self-explanatory
- DepLink(V-pl[cor]): do not attach a V-pl[cor]
- *C-pl[lab]/[cor]/[lab]: self-explanatory
- Conjunction of *C-pl and DepLink: "do not attach V-pl[cor] to this type of consonant"
  - Can be undominated ⇒ no docking
  - Can be repaired by undoing the violation of DepLink ⇒ no docking
  - Can be repaired by undoing the violation of *C-pl ⇒ deletion of C-pl and attachment of V-pl[cor] = postalveolars
  - Can be dominated ⇒ docking of V-pl[cor] leads to surface palatalization
- Ignoring additional complications which don't change the picture…

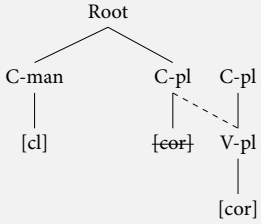
Surface palatalization

- Max(V-pl[cor]), Max(C-pl) ≫ DepLink(V-pl[cor])
- Realize both the consonant's underlying feature and the floating feature



Place-changing palatalization

- Unified name for velar and transitive palatalization: same output, would be good to have a unified representation
- Max(V-pl[cor]), DepLink(V-pl[cor]) ≫ Max(C-pl)



No docking scenarios

- The feature may fail to surface at all ⇒ non-palatalizing suffixes, such as the /ɨ/
- It may also force the epenthesis of some material to attach to
- Attested as labial epenthesis: /p b m f v/ → pʲ bʲ mʲ fʲ vʲ
- But the ranking is clearly contradictory: how can all these be attested in a single language

Lexical indexation I

- I suggest that the different palatalizing properties of Russian suffixes can be accommodated via lexical indexation (Pater 2009)
- So each class of suffixes has a corresponding ranking of the relevant constraints
- Contrast this with the Stratal OT approach of Blumenfeld (2003):
  - SOT: velar palatalization happens at the stem level, surface palatalization happens at the stem level, differences accommodated via stratum-specific ranking
  - Proposed approach: differences in the outcome of palatalization are due to arbitrary lexical indexes
  - Loss of generalization relative to SOT, even though the insight can still be expressed ("such-and-such indexes are associated with word-level suffixes")

Lexical indexation II

- Better empirical adequacy
  - Unified expression of place-changing palatalization
  - Correctly expresses the lack of a principled relationship between vowel frontness and palatalizing properties (other than diachronically)
  - Correctly expresses the types of palatalizing processes possible in Russian
- Give me empirical adequacy over loss of generalization any day

The notorious /v/

- Obstruent-like: undergoes word-final devoicing

(5) a. [ˈlʲva] 'lion (gen. sg.)'
b. [ˈlef] 'lion'

- Sonorant-like: fails to trigger voicing assimilation

(6) a. [ˈtvʲordʲij] 'hard'
b. [ˈdvʲerʲ] 'door'

- Also, and famously, postlexically

(7) [ɐt vrɐˈga] 'from an enemy'

The classic analysis

- Underlyingly, the [v] is /w/
- Becomes an obstruent by a later rule
- Crucially, obstruentization must precede voicing assimilation since they stand in a counterfeeding relation
- But voicing assimilation must be postlexical, since it applies across word boundaries

(8) [ɐd ˈdomə] 'from the house'

- Postlexical ordering is an issue…

Representational solution

- In a privative feature theory, what is the actual evidence of /v/ having the feature [voice]?
- Final devoicing (if it is in fact phonological)
- But can we model it without reference to the feature [voice]?
- Let's assume /f/ is just {C-place[lab]} (cf. Morén 2006 for Serbian)
- Then /v/ can be {C-place[lab],C-manner[open]} and still be distinct from /f/
- Separate constraint to enforce final devoicing of [v] by deletion of the manner feature
- Loss of generality
- But empirically adequate
- And gets around the voicing assimilation problem: if /v/ does not have [voice], we do not expect it anyway.

How good is phonological evidence?

- It is not my purpose here to argue for this specific analysis
- But it does seem that many of the facts previously argued to absolutely require serial derivation in phonology could in principle be reanalyzed
- What would the compelling evidence look like?
  - Demonstrably phonological
  - Crucially ordered processes
  - Operating categorically on contrastive symbols
  - Not amenable to a representational analysis (e. g. preservation of subsegmental elements as opposed to spreading-and-deletion)
- Place to look for: languages with really long derivations: Sanskrit? Sámi?
- I don't know

Phonology ignoring syntax

- I have hopefully shown that (Russian) phonological data supporting multiple-level derivations are not quite as compelling
- In terms of OT, the analysis is quite orthodox
- Yet it uses at least two devices which on general grounds could be questionable:
  - Local conjunction: questions of restrictiveness, learnability (also ability to express generalizations: Potts et al. 2010)
  - Lexical indexation: indirect reference? Cf. recent work by Scheer
- Can we really make architectural claims like these without reference to syntactic work?
- You tell me!

Summary

- Analysis of a number of phenomena in Russian which have traditionally been argued to support multiple-level derivations
- Claim: analysis more empirically adequate in terms of the phonological phenomena
- Loss of generality in terms of stating the conditioning, but arguably preferable over an elegant but insufficient analysis
- ☞ I am not really arguing for fully parallel OT
- Just showing that a number of reasonable assumptions about phonological computation can help us run with this ball much further than assumed in some of the literature

Quis custodiet ipsos custodies?

- Can phonological data alone be used to resolve the number-of-levels debate?
- I am not so sure
- Other evidence:
  - Coherent theory of diachrony (Bermúdez-Otero 2007)
  - A Theory of Everything? (Vaux 2008)
  - ?????
  - Maybe purely phonological evidence is enough after all?
- Future work

References I

Bermúdez-Otero, Ricardo. 2007. Diachronic phonology. In Paul de Lacy (ed.), *The Cambridge handbook of phonology*, 497–518. Cambridge: Cambridge University Press.

Blaho, Sylvia. 2008. *The syntax of phonology: a radically substance-free approach*. Ph.D. thesis, University of Tromsø.

Blumenfeld, Lev. 2003. Russian palatalization and Stratal OT: morphology and [back]. In Wayles Brown, Ji-yung Kim, Barbara Partee & Robert Rothstein (eds.), *Annual workshop on formal approaches to Slavic linguistics: the Amherst meeting 2002*, 141–158. Ann Arbor: Michigan Slavic Publications.

Chomsky, Noam & Morris Halle. 1968. *The sound pattern of English*. New York: Harper and Row.

Dresher, B. Elan. 2009. *The contrastive hierarchy in phonology*. Cambridge: Cambridge University Press.

References II

Flier, Michael S. 1982. Morphophonemic change as evidence of phonemic change: the status of the sharped velars in Russian. *International journal of Slavic linguistics and poetics* 25–26. 137–148.

Gribanova, Vera. 2009. Phonological evidence for a distinction between Russian prepositions and prefixes. In Gerhild Zybatow, Denisa Lenertová, Uwe Junghanns & Petr Biskup (eds.), *Studies in formal Slavic phonology, morphology, syntax, semantics and information structure: Proceedings of FDSL 7, Leipzig*, 383–396. Frankfurt: Peter Lang.

Hall, Daniel Currie. 2007. *The role and representation of contrast in phonological theory*. Ph.D. thesis, University of Toronto.

Halle, Morris. 1959. *The sound pattern of Russian: a linguistic and acoustical investigation*. 's Gravenhage: Mouton.

References III

Halle, Morris & Ora Matushansky. 2002. [αback] assimilation in Russian: an overview. In Aniko Csirmaz, Zhiqiang Li, Andrew Nevins, Olga Vaysman & Michael Wagner (eds.), *Phonological answers (and their corresponding questions)*, vol. 42, MIT working papers in linguistics, 69–80. Cambridge, MA: MITWPL.

Kiparsky, Paul. 1985. Some consequences of Lexical Phonology. *Phonology Yearbook* 2. 85–138.

Lightner, Theodore M. 1972. *Problems in the theory of phonology 1: Russian phonology and Turkish phonology*. Edmonton: Linguistic Research.

Mołczanow, Janina. 2007. Russian vowel reduction and phonological opacity. *Slavonic and East European Review* 85(2). 201–230.

Mołczanow, Janina. 2008. Gliding in Russian. *Lingua* 118(8). 1080–1108. doi:10.1016/j.lingua.2008.01.005.

Morén, Bruce. 2003. The Parallel Structures model of feature geometry. In *Working Papers of the Cornell Phonetics Laboratory*, vol. 15, 194–270. Ithaca, NY.

References IV

Morén, Bruce. 2006. Consonant–vowel interactions in Serbian: Features, representations and constraint interactions. *Lingua* 116. 1198–1244.

Morén, Bruce. 2007. The division of labour between segment-internal structure and violable constraints. In Sylvia Blaho, Patrik Bye & Martin Krämer (eds.), *Freedom of analysis?* (Studies in generative grammar 95), 313–344. Berlin: Mouton de Gruyter.

Padgett, Jaye. 2001. Contrast dispersion and Russian palatalization. In Elizabeth V. Hume & Keith Johnson (eds.), *The role of speech perception in phonology*, 187–218. San Diego: Academic Press.

Padgett, Jaye. 2004. Russian vowel reduction and Dispersion Theory. *Phonological Studies* 7. 81–96.

Pater, Joe. 2009. Morpheme-specific phonology: constraint indexation and inconsistency resolution. In Steve Parker (ed.), *Phonological argumentation: essays on evidence and motivation* (Advances in Optimality Theory 5), 123–154. London: Equinox.

References V

Plapp, Rosemary Kuhn. 1996. Russian /i/ and /ɨ/ as underlying segments. *Journal of Slavic Linguistics* 4. 76–108.

Plapp, Rosemary Kuhn. 1999. *Lexical Phonology and Optimality Theory: analysis of Russian*. Ph.D. thesis, University of Iowa.

Potts, Christopher, Joe Pater, Karen Jesney, Rajesh Bhatt & Michael Becker. 2010. Harmonic Grammar with linear programming: from linear systems to linguistic typology. *Phonology* 27(1). 77–117.

Rubach, Jerzy. 2000. Backness switch in Russian. *Phonology* 17. 39–64.

Rubach, Jerzy. 2005. Mid vowel fronting in Ukrainian. *Phonology* 22. 1–36.

Rubach, Jerzy. 2007. Feature geometry from the perspective of Polish, Russian, and Ukrainian. *Linguistic Inquiry* 38(1). 85–138.

Timberlake, Alan R. 1978. K istorii zadnenebnyx fonem v severnoslavyanskix jazykax. In Henrik Birnbaum (ed.), *American contributions to the Eighth Iinternational Congress of Slavists*, vol. 1. Linguistics and Poetics, 699–716. Columbus: Slavica Publications.

References VI

Vaux, Bert. 2008. Why the phonological component must be serial and rule-based. In Bert Vaux & Andrew Nevins (eds.), *Rules, constraints and phonological phenomena*, 20–61. Oxford: Oxford University Press.

Wolf, Matthew. 2007. For an autosegmental theory of mutation. In Michael O'Keefe, Ehren Reilly & Adam Werle (eds.), *University of Massachusetts Occasional Papers in Linguistics 32: Papers in Optimality Theory III*, 315–404. Amherst: GLSA.